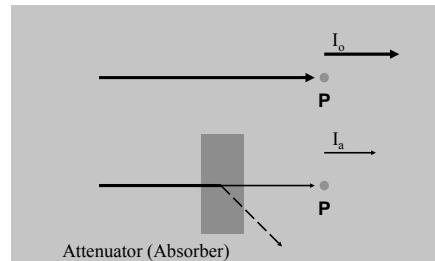


Attenuation of X Rays

Absorption of X Rays

Attenuation of X Rays

Definition of Attenuation



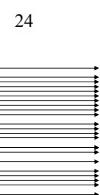
Attenuation of X Rays

Effect of Attenuator Thickness

Equal thicknesses of a given attenuator remove equal fractions of the beams energy.

Attenuation of X Rays

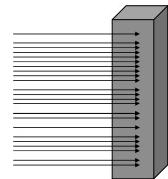
Effect of Attenuator Thickness



Attenuation of X Rays

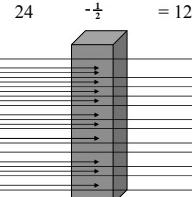
Effect of Attenuator Thickness

24

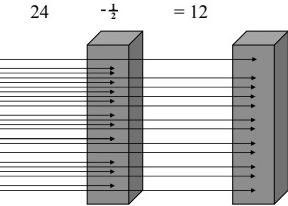


Attenuation of X Rays

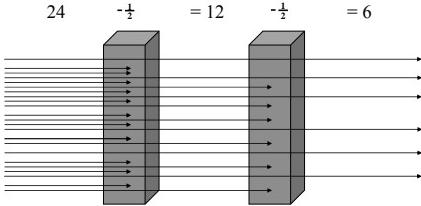
Effect of Attenuator Thickness



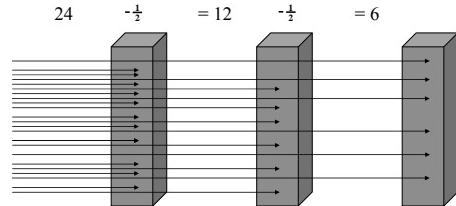
Attenuation of X Rays Effect of Attenuator Thickness



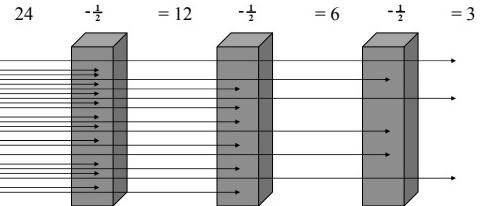
Attenuation of X Rays Effect of Attenuator Thickness



Attenuation of X Rays Effect of Attenuator Thickness



Attenuation of X Rays Effect of Attenuator Thickness



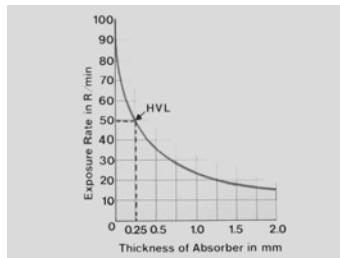
Attenuation of X Rays

Half Value Layer
(HVL)

Attenuation of X Rays Half Value Layer (HVL)

The thicknesses of an attenuator that reduces the intensity of the beam to one half.

Attenuation of X Rays
Half Value Layer (HVL)



Attenuation of X Rays
Half Value Layer (HVL)

This is not a measurement of the attenuator, but of the mean energy level of the beam.

Attenuation of X Rays

6

Methods
of
Attenuation

Attenuation of X Rays

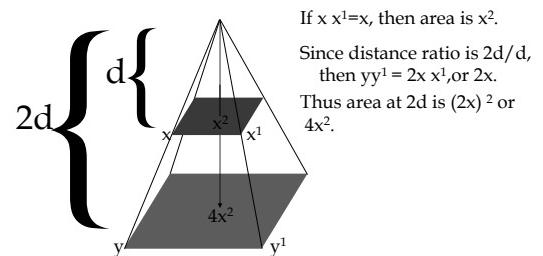
1

Method
is
Geometry-based

Attenuation of X Rays

Inverse
Square
Law

Attenuation of X Rays
Inverse Square Law = Distance



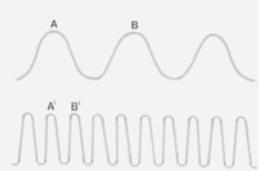
Attenuation of X Rays

5

Methods
are
Interactive

Attenuation of X Rays

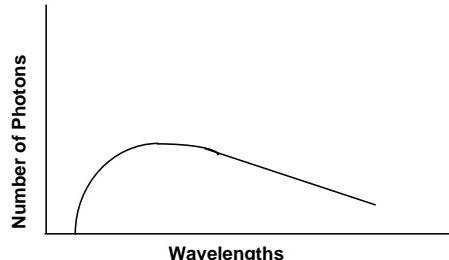
Different wavelength of photons



= different energies for interactions

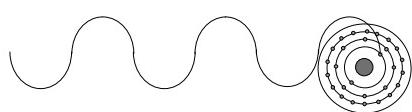
Attenuation of X Rays

Spectrum of Wavelengths: Polychromatic



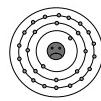
Attenuation of X Rays

Coherent Scatter: Thomson Effect



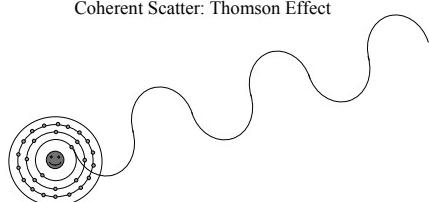
Attenuation of X Rays

Coherent Scatter: Thomson Effect

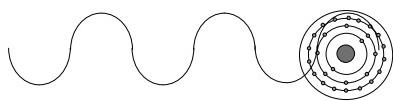


Attenuation of X Rays

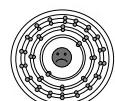
Coherent Scatter: Thomson Effect



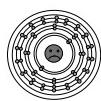
Attenuation of X Rays
Coherent Scatter: Rayleigh Effect



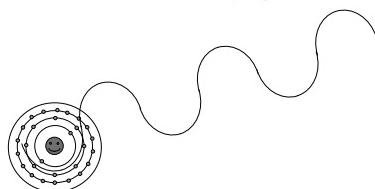
Attenuation of X Rays
Coherent Scatter: Rayleigh Effect



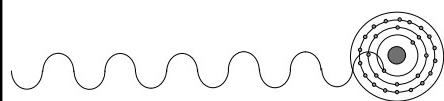
Attenuation of X Rays
Coherent Scatter: Rayleigh Effect



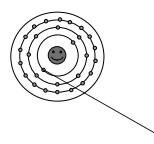
Attenuation of X Rays
Coherent Scatter: Rayleigh Effect



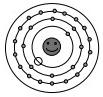
Attenuation of X Rays
Photoelectric Effect



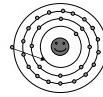
Attenuation of X Rays
Photoelectric Effect



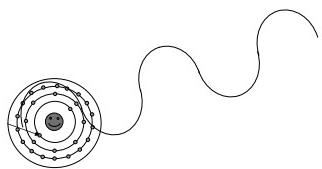
Attenuation of X Rays
Photoelectric Effect



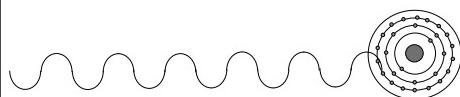
Attenuation of X Rays
Photoelectric Effect



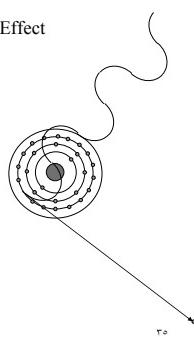
Attenuation of X Rays
Photoelectric Effect



Attenuation of X Rays
Incoherent Scatter: Compton Effect

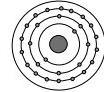


Attenuation of X Rays
Incoherent Scatter: Compton Effect

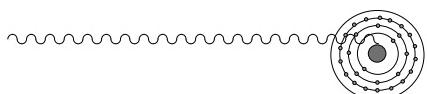


Attenuation of X Rays
Pair Production and Annihilation Reaction

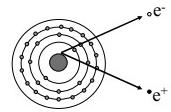
1.02 MeV



Attenuation of X Rays
Pair Production and Annihilation Reaction



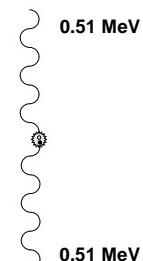
Attenuation of X Rays
Pair Production and Annihilation Reaction



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Pair Production and Annihilation Reaction



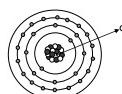
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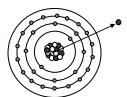
Attenuation of X Rays
Photonuclear Disintegration



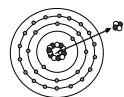
Attenuation of X Rays
Photonuclear Disintegration



Attenuation of X Rays
Photonuclear Disintegration



Attenuation of X Rays
Photonuclear Disintegration



Attenuation of X Rays

Secondary and Scattered Radiation
Consists of

1. Secondary electrons
 - a. Photoelectrons
 - b. Compton or recoil electrons
 - c. Pair production electrons

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Attenuation of X Rays

2. Secondary and scattered x rays
 - a. Coherent (unmodified) scattered
 - b. Characteristic
 - c. Compton (modified)
 - d. Annihilation
3. Nuclear particles
 - a. Protons
 - b. Neutrons
 - c. Alpha particles
 - d. Other particles

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